

REMARKS

Claims 1, 3, 12, 15, 16, and 19 are pending in the above-identified application. Claims 5-11, 13, 14, 17, 18, and 20 were previously canceled without prejudice or disclaimer. Claims 2 and 4 are further canceled without prejudice or disclaimer. Claims 1, 15, 16, and 19 are independent.

SUMMARY OF OFFICE ACTION

The outstanding Action acknowledges the submission of the Information Disclosure Statement with cited references filed July 3, 2008.

The outstanding Action further presents a rejection of claims 1-4, 12, 15, 16, and 19 under 35 U.S.C. 103(a) as being unpatentable over Noda et al. (JP 2003-045811, hereinafter Noda) in view of Yang (U. S. Patent No. 6,641,673) and in further view of Okuda et al. (U.S. Published Patent Application No. 2003/0024477, hereinafter "Okuda"), a rejection of claims 1-4, 12, 15, 16, and 19 under 35 U.S.C. 103(a) as being unpatentable over Noda in view of Yoshino Akihito (JP 2003-045811, hereinafter "Akihito") and in further view of Okuda, and a rejection of claims 1-4, 12, 15, 16, and 19 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (U.S. Patent No. 6,383,300, hereinafter "Saito") in view of Yang and in further view of Okuda.

REJECTIONS OF CLAIMS 1-4, 12, 15, 16, AND 19

Item 3 on page 2 of the outstanding Action sets forth the above-noted first rejection of claims 1-4, 12, 15, 16, and 19 under 35 U.S.C. 103(a) as being as being unpatentable over Noda in view of Yang and in further view of Okuda. Item 4 on page 3 of the outstanding Action sets forth the above-noted alternative rejection of claims 1-4, 12, 15, 16, and 19 under 35 U.S.C. 103(a) as being as being unpatentable over Noda in view of Akihito and in further view of Okuda and item 5 on page 4 of the outstanding Action sets forth the above noted third alternative rejection of claims 1-4, 12, 15, 16, and 19 under 35 U.S.C. 103(a) as being unpatentable over Saito in view of Yang and in further view of Okuda.

All of the rejections presented as to claims 2 and 4 are considered to be moot as these claims have been canceled without prejudice or disclaimer as noted above. With further regard to claims 1, 3, 12, 15, 16, and 19, all of these alternative rejections are traversed.

According to the present invention as described in amended independent claims 1, 15, 16, and 19, there are provided a plurality of nozzles having different lengths through which reaction gas is to be supplied into the reaction container. Each of the plurality of nozzles includes a horizontal portion extending in a horizontal direction and a vertical portion rising in a vertical direction. The horizontal portion is attached to a sidewall of the reaction container such that the horizontal portion penetrates the sidewall of the reaction container. The vertical portion is disposed in the reaction container apart from an inner wall of the reaction container such that a portion of the vertical portion is opposed to the heater. A flow-path cross-sectional area of the portion of the vertical portion that is opposed to at least the heater is greater than a flow-path cross-sectional area of the horizontal portion. A flow-path cross-sectional shape of the portion of the vertical portion that is opposed to at least the heater is formed into a substantially elliptic shape with a short axis thereof oriented toward a central portion of the substrate.

Providing the flow-path cross-sectional area of the vertical portion opposed to at least the heater that is greater than the flow-path cross-sectional area of the horizontal portion with respect to each of the plurality of nozzles having different lengths suppresses the clogging of the nozzle in the vertical portion, and increases the number of substrate processing operations by the associated substrate processing apparatus before maintenance is required. See paragraph [0079] of Patent Application Publication No. U.S. 2007/0034158 corresponding to this application, for example.

In addition to this requirement for the vertical portion opposed to at least the heater having a greater flow path cross-sectional area than that of horizontal portion, the amended independent claims 1, 15, 16, and 19 now require that the flow-path cross-sectional shape of the portion of the vertical portion that is opposed to at least the heater must be a substantially elliptic shape with a short axis thereof oriented toward a central portion of the substrate.

Such a combination of the substantially elliptical cross-sectional shape and greater cross-sectional area of the vertical portion opposed at least to the heater has the advantage of not requiring any increase in clearance between the substrate and the reaction container even though the flow-path cross-sectional area of the vertical portion that is opposed to at least the heater is greater than the flow-path cross-sectional area of the horizontal portion. Therefore, it is possible

to use a reaction container having the same shape of nozzle attachment portion as that of a conventional reaction container. Thus, there is no need to change the design of the reaction container. See paragraph [0080] of the Patent Application Publication No. U.S. 2007/0034158 corresponding to this application, for example.

Contrary to this, if a circular shape is employed as the flow-path cross-sectional shape of the vertical portion of each of the plurality nozzles that are opposed to at least the heater in the same way as in the conventional technology, and the flow-path cross-sectional area of the portion of each of the nozzles that are opposed to at least the heater is simply made to be greater than the flow-path cross-sectional area of the horizontal portions of these nozzles, it would be necessary to extend the clearance between the substrate and the reaction container in accordance with such an increase in cross-sectional area of each of the plurality of nozzles as compared to conventional nozzles. Hence, such a modification makes it necessary to newly design (change the design of) the reaction container by increasing a diameter of the reaction container, etc.

In addition, because the cross-sectional shape of the portion of each of the nozzles that is opposed to at least the heater, of the vertical portion of each of the plurality of nozzles is made to have the elliptic shape, clearance between the substrate and the reaction container can even be reduced. With such a clearance reduction, the gas concentration over the entire surface of the substrate can be equalized, and uniformity of film thickness over the entire surface of the substrate and uniformity of film quality over the entire surface of the substrate can be enhanced. Further, the volume of the reaction tube can be reduced, and an amount of gas being used can be lowered to save gas. Further, the apparatus can also be reduced in size. For example, see paragraph [0081] of the Patent Application Publication No. U.S. 2007/0034158 corresponding to this application.

Contrary to the present invention, if a circular shape is employed as the flow-path cross-sectional shape of each vertical nozzle portion that is opposed to at least the heater as in the conventional technology, and the flow-path cross-sectional area of the each vertical nozzle portion that is opposed to at least the heater is made greater than the flow-path cross-sectional area of the corresponding horizontal portion of each of the nozzles, it becomes necessary to extend the clearance between the substrate and the reaction container in accordance with the

increase in cross-sectional area of each of the plurality of nozzles. Hence, it is impossible to obtain the above-mentioned advantages of the present invention in terms of extending the time for required nozzle maintenance without requiring an increase in clearance between the substrate and the reaction container.

Moreover, if the claimed substantially elliptic shape is employed as the cross-sectional shape of each vertical nozzle portion that is opposed to at least the heater as in the independent claims, this shape can be easily formed by pressing and a circular tube from the opposite sides.

All of the applied references (Noda in view of Yang and in further view of Okuda or Noda in view of Akihito and in further view of Okuda or Saito in view of Yang and in further view of Okuda) fail to disclose or suggest providing the claimed advantageous flow-path cross-sectional shape as to each vertical nozzle portion that is opposed to at least the heater in terms of this portion being formed into a substantially elliptic shape having a short axis thereof oriented toward a central portion of the substrate.

The above-noted three rejections of claims 1-4, 12, 15, 16, and 19 under 35 U.S.C. 103(a) (as being unpatentable over Noda in view of Yang and in further view of Okuda or as being unpatentable over Noda in view of Akihito and in further view of Okuda or as being unpatentable over Saito in view of Yang and in further view of Okuda) are all clearly improperly based upon hindsight rationales that lack the “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness” required by *KSR Int’l v. Teleflex Inc.*, 127 S.Ct. 1727, 82 USPQ.2d 1385, 1396 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). In this regard, the outstanding Action (at pages 4 and 5) states, for example, that:

Yang teaches that flared section at the exit of a gas outlet reduces unwanted deposition to clog the flow path . . . It is noted that it is consistent with common sense that narrow area nozzles will clog earlier.

Therefore having vertical sections larger diameter and area will be better from the point of long hours of use before clogging.

Regarding the particular shape it is noted that having a radical dimension small may be compensated by having large dimension along the direction of the wall for the same area.

Okuda et al. disclose cross section of nozzle which is narrower along radial direction and wider in the perpendicular direction (Figs. 1-3).

It would therefore be obvious for one of ordinary skill in the art to have a cross section of nozzle which is narrower along radial direction and wider in the perpendicular direction for larger area without increasing the overall diameter of the processing chamber."

However, Yang only discloses a flared structure of an opening which reduces unwanted deposition and Yang does not disclose a nozzle itself which reduces unwanted deposition. Accordingly, Yang at best teaches a flared structure of an opening provided at the nozzle.

To the extent that this would teach enlarging the nozzle because common sense indicates that a larger nozzle is less likely to clog, this would apply to the full extent of the nozzle as no teaching or suggestion by the prior art has been presented that would suggest some reason to just enlarge the vertical portion of the nozzles opposed to at least the heater and not the remainder of the nozzle. Conjecture and assumption cannot be substituted for facts that have not been placed on the record. *See In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967) ("The Patent Office has the initial duty of supplying the factual basis for its rejection. It may not . . . resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in its factual basis.").

Further, in Okuda, a vertical portion of the gas nozzle 21 is secured all along an inner wall 22 of the cylinder reaction tube 12 that serves as a wall of the nozzle and a wall of the reaction container. Therefore the nozzle 21 of Okuda necessarily has walls on both sides thereof that will have the same arc-shape as that of the wall 22. See paragraph [0037] and FIG. 2 of Okuda. Thus, Okuda does not teach or suggest a structure of nozzle which is disposed apart from an inner wall of a reaction container. Still further, even if a larger diameter and larger area nozzle would be better from the point of view of providing long hours of use before clogging, it would not have been obvious that a flow-path cross-sectional area of the portion of the vertical portion that is opposed to at least the heater should be greater than a flow-path cross-sectional area of the horizontal portion because Okuda and the other applied references do not teach this or the required shape of this vertical portion.

In this last regard, it is noted that there is nothing in the *KSR* decision that frees the PTO from having to comply with the Administrative Procedure Act. The PTO reviewing court has noted more than once that the PTO falls under the Administrative Procedure Act that requires the PTO to provide "substantial evidence," not mere unsubstantiated opinions and conclusions. *See In re Lee*, 217 F.3d 1365, 61 USPQ2d 1430, 1433-34 (Fed. Cir. 2002) as follows:

Tribunals of the PTO are governed by the Administrative Procedure Act, and their rulings receive the same judicial deference as do tribunals of other administrative agencies. *Dickinson v. Zurko*, 527 U.S. 150, 50 USPQ2d 1930 (1999). Thus on appeal we review a PTO Board's findings and conclusions in accordance with the following criteria:

5 U.S.C. 706(2) The reviewing court shall

(2) hold unlawful and set aside agency actions, findings, and conclusions found to be

(A) arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law;

* * * *

(E) unsupported by substantial evidence in a case subject to sections 556 and 557 of this title or otherwise reviewed on the record of an agency hearing provided by statute;

For judicial review to be meaningfully achieved within these strictures, the agency tribunal must present a full and reasoned explanation of its decision. The agency tribunal must set forth its findings and the grounds thereof, as supported by the agency record, and explain its application of the law to the found facts. The Court has often explained:

The Administrative Procedure Act, which governs the proceedings of administrative agencies and related judicial review, establishes a scheme of Reasoned decision making. Not only must an agency's decreed result be within the scope of its lawful authority, but the process by which it reaches that result must be logical and rational.

Also, and as noted in the last response, it is well established that a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ

303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984) 270 F.2d at 813, 123 USPQ at 352. Here the teachings of Okuda considered as a whole clearly lead away from the claimed invention because the nozzle cross-sectional shape with inner and outer arc-shaped walls taught by Okuda relates to the nozzle being formed to include the arc-shaped container wall, subject matter prohibited by the independent claims.

Page 3 of the outstanding Action also draws improper conclusions not based on reference teachings as follows:

Yashino Akihito discloses a similar processing apparatus and discloses narrowing of inlet nozzles due to deposition. It would therefore make sense to have nozzles with larger area to increase the unusable time between cleaning.

Therefore having vertical sections larger diameter and area will be better from the point of long hours of use before clogging.

However, Akihito only discloses that reaction products are deposited in the inner walls of the nozzles 43, 44 and 45, and to remove the deposited reaction products, cleaning gas is introduced from the inlets of the nozzles 43, 44 and 45. Akihito does not disclose or suggest that nozzles with larger area increase unusable time between cleaning.

Further, even if larger diameter and area would be better from the point of long hours of use before clogging, it would not have been obvious to provide only the flow-path cross-sectional area of the portion of the vertical portion that is opposed to at least the heater to be greater than a flow-path cross-sectional area of the horizontal portion as there is nothing taught by Akihito or any of the other relied on references that would suggest this. Once again the teachings of the inventor are being improperly used against the inventor in a prohibited hindsight reconstruction.

Turning to the required shape of the vertical nozzle portions adjacent to the heater, page 3, 4, and 5 of the outstanding Action commit further error by noting that:

Regarding the particular shape it is noted that having a radical dimension small may be compensated by having large dimension along the direction of the wall for the same area.

Okuda et al. disclose cross-section of nozzle which is narrower along radial omit further error direction and wider in the perpendicular direction (Figs. 1-3).

It would therefore be obvious for one of ordinary skill in the art to have a cross-section of nozzle which is narrow along radial direction and wider in the perpendicular direction for larger area without increasing the overall diameter of the processing chamber.

However, and as noted above, Okuda actually teaches that a vertical portion of the gas nozzle 21 is secured all along the arc-shaped inner wall of the cylinder reaction tube 12 serving as the shared nozzle and reaction container wall. Therefore the nozzle 21 of Okuda necessarily has walls on both sides thereof that will have the same arc-shape as that of the shared wall. Okuda does not teach or suggest a structure of nozzle which is disposed apart from an inner wall of a reaction container. Still further, even if a larger nozzle diameter and nozzle cross-sectional area would be better from the point of view of providing long hours of use before clogging, there has been no evidence provided by the outstanding Action to establish any reasonable basis for asserting that it would have been obvious that a flow-path cross-sectional area of just the vertical nozzle portion that is opposed to at least the heater should be greater than a flow-path cross-sectional area of the horizontal portion of that same nozzle. Nothing in Okuda and the other applied references teach or suggest this and conjecture cannot replace actual evidence as noted above..

Therefore, as independent claims 1, 15, 16, and 19 include at least the above-noted subject matter that is not taught or reasonably suggested by Noda in view of Yang and in further view of Okuda, Noda in view of Akihito and in further view of Okuda, and/or Saito in view of Yang and further in view of Okuda, the withdrawal of these three alternative rejections of independent claims 1, 15, 16, and 19 under 35 U.S.C. 103(a) is respectfully requested.

As claims 3 and 12 depend directly from independent claim 1, they are submitted to patentably define over Noda in view of Yang and in further view of Okuda, Noda in view of Akihito and in further view of Okuda, and/or Saito in view of Yang and further in view of Okuda for at least the same reasons as independent claim 1. In addition, claims 2-4 and 12 add further features not taught or suggested by any of the applied references. Thus, the withdrawal of the alternative rejections of claims 3 and 12 under 35 U.S.C. §103(a) is also respectfully requested.

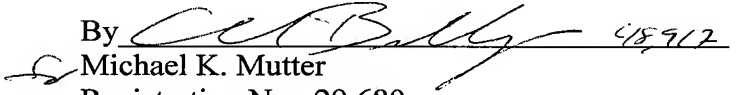
CONCLUSION

Should there be any outstanding matters that need to be resolved in the present Application, the Examiner is respectfully requested to contact Raymond F. Cardillo, Jr., Reg. No. 40,440 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

By  4/8/09
Michael K. Mutter
Registration No.: 29,680
BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Road
Suite 100 East
P.O. Box 747
Falls Church, Virginia 22040-0747
(703) 205-8000
Attorney for Applicant